

intervened between them, is very remarkable, and could only have been attained, however perfect the instrument, by the method of observation which has been described, unless indeed the readings had been taken to fractions of a scale division.

In the course of my experience in working with the instrument, I have naturally become acquainted with a number of little devices, difficult to describe, which would give me an advantage over a novice in its use. But I believe that any competent manipulator would find it quite easy to obtain uniform and consistent results with it.

The efficiency of the apparatus is due partly to the perfection of the optical arrangements and partly to the fact that in the moving parts unnecessary lightness has not been acquired at the expense of sufficient massiveness and rigidity.

III. "Remarks on the Cloaca and on the Copulatory Organs of the Amniota." By Dr. GADOW. Communicated by Professor M. FOSTER, Sec. R.S. Received March 11, 1886.

(Abstract.)

The sphincter muscles of the anus of Crocodilia are differentiations of the postpelvic portion of the system of the m. rectus abdominis rather than of the true caudal muscles.

The copulatory muscles of the Carinatæ are derived from the m. sphincter ani solely, whilst in the Ratitæ they are also differentiations of muscles which are still attached to the pelvis, and are, therefore, skeleto-genital.

The mammalian sphincter ani does not take a share in the muscle supply of the copulatory organ, and thus exhibits a difference from Birds and Lizards.

Distinctly copulatory muscles in the Mammalia are derived from skeletal and from non-striped muscles. In this respect the Mammalia agree with Crocodilia and Chelonia.

Then the author describes the nerve-supply of the cloacal region in Crocodilia.

Third Chapter.—The modifications of the cloaca in the various chief groups of Amniota: *Crocodilia*, Lizards, Snakes, *Hatteria*, Birds, Tortoises, Mammals.

Lizards and snakes together represent a special type.

Hatteria comes nearest the Amphibia, or the embryonic condition of Sauropsida; bears, however, resemblance to the Lizards.

Chelonia represent a type somewhat intermediate between that of the Ratitæ and Crocodilia and that of the Monotremata, at the same time bearing slight resemblance to that of the Sauria.

Then the anal sacs or cloacal bladders of the Chelonia are critically discussed with reference to experiments on their being able to take in water.

Then follows a discussion of the peritoneal canals.

The cloacal and copulatory organs of the Chelonia lead with comparatively slight modifications to the Monotremata, from which again a continuity of stages up to the highest Placentalia can be traced.

The whole cloaca of the Amniota consists originally, either permanently or in the embryo only, of three successive chambers which may be distinguished as follows :—

- I. The Proctodæum (termed thus by Professor Lankester). It is the outermost anal chamber of epiblastic origin. With its derivatives : (1) Bursa Fabricii in birds; (2) various hedonic glands in most Amniota; (3) the copulatory organs, the at least partly epiblastic nature of which is indicated by the frequently developed horny armament of the glans, by the various sebaceous glands, and as shown in this paper by its development.
- II. The Urodæum, from *οὐρόν* and *διαν.* Hypoblastic. This is the middle chamber or primitive cloaca, into which open the urinogenital ducts, and through which pass the faeces. With its differentiations : (1) urinary bladder, ventral; (2) anal sacs in Tortoises, dorsal.
- III. The Coproductæum, from *κόπρος* and *διαν.* This is the innermost cloacal chamber.

The Urodæum is the oldest portion of the whole cloaca, then follows the Proctodæum, and, lastly, the Coproductæum has secondarily assumed cloacal functions.

The various modifications of these three chambers, their function, and the gradual separation of faeces, urine, and genital products have been discussed in the third chapter, and are summarily explained in a table.

A short note on the presence of Muellerian ducts in the males, and of Wolffian ducts in the females of young Crocodilia.

Lastly, general conclusions regarding the phylogenetic development and the homologies of the copulatory organs of the Amniota.